

REMARKS

The present Amendment amends claims 1, 6-9, 15 and 19 and leaves claims 2-5, 10-14, 16-18 and 20-22 unchanged. Therefore, the present application has pending claims 1-22.

Applicants acknowledge the Examiner's indication in paragraph 2 of the Office Action that claims 7 and 8 would be allowable if rewritten to overcome the rejection under 35 USC §112, second paragraph and to include all the limitations of the base claim and any intervening claims. Applicants note that the Office Action did not set forth any rejection of any of the claims, particularly claims 7 and 8, under 35 USC §112, second paragraph. Thus, claims 7 and 8 in their current condition complies with the requirements of 35 USC §112, second paragraph.

Amendments were made to claims 7 and 8 to place them in independent form including all the limitations of the base claim and any intervening claims. Therefore, claims 7 and 8 are now in condition for allowance as indicated by the Examiner.

Claims 1-6 and 9-22 stand rejected under 35 USC §103(a) as being unpatentable over Kitagawa (U.S. Patent No. 5,522,037) in view of Shackelford (U.S. Patent Application Publication No. 2005/0081006 A1). This rejection is traversed for the following reasons. Applicants submit that the features of the present invention as now more clearly recited in claims 1-6 and 9-22 are not taught or suggested by Kitagawa or Shackelford whether taken individually or in combination with each other as suggested by the Examiner. Therefore, Applicants respectfully request the Examiner to reconsider and withdraw this rejection.

Amendments were made to the claims so as to more clearly describe features of the present invention. Particularly, amendments were made to the claims to more recite that the present invention is directed to a storage system and data backup method for the storage system wherein the storage system includes a disk controller which has a CPU, main memory and an interface, and a disk device which has original volumes and a storage pool for backup data.

According to the present invention as recited in the claims the main memory incorporates a differential management program which checks whether the original volumes for backup are updated or not, a pool management program which allocates a disk area for storage of backup data to the stored pool for backup data, a performance management program which manages the performance of each volume of the disk device and a backup control program which issues an instruction to the differential management program, the pool management program for total backup control. The backup control program according to the present invention selects a backup method by which recovery within a user specified recovery object time is possible, according to the restore performance calculated by the performance management program and the totals size of changed blocks after backup acquisition, as counted by the differential management program.

Unique according to the present invention is that the performance management program maintains a performance management table which is used to manage and disk and volume performance and calculate the restore performance. The performance management table includes for each volume at least information of a Redundant Array of Inexpensive Disks (RAID)

configuration which constitute the volume, information indicating a read performance of the volume and information indicating a write performance of the volume. According to the present invention the restore performance is calculated based on at least the RAID configuration, read performance and write performance of each volume.

The above described features of the present invention now more clearly recited in the claims are not taught or suggested by any of the references of record whether taken individually or in combination with each other. Particularly, the above described features of the present invention now more clearly recited in the claims are not taught or suggested by Kitagawa or Shackelford whether taken individually or in combination with each other.

Kitagawa teaches a backup control apparatus and method wherein the number of present updating data is detected from an updating bit map of a backup target medium so that when the number of present updating data is equal to or larger than a reference value, an entire backup is executed and when the number of present updating data is smaller than the reference value, a differential backup is executed.

In the Office Action the Examiner makes an unsupported allegation that:

“Kitagawa teaches a backup system and issuing a backup instruction to backup management program”...and that “the backup control program selects a backup method, according to a restore performance calculated by the performance management program and the total size of change blocks after backup acquisition as counted by the differential management program (col. 13, lines 53-65)”.

At no point in the Office Action does the Examiner identify any specific teaching in Kitagawa to support his allegation that such features are taught or suggested by Kitagawa. In fact, upon complete and thorough review of Kitagawa Applicants were unable to find any such teaching corresponding to these features as recited in the claims.

Kitagawa simply teaches a backup control apparatus and method in which the number of present updating data is detected using an updating bit map and based on the number the particular backup processing is selected. In other words, in Kitagawa if the number exceeds a reference value then an entire backup is performed and if not a differential backup is performed. Thus, there is no teaching or suggestion in Kitagawa that the backup taught therein is performed not only based upon the number of present updating data, but also the read/write performance and RAID configurations of the volumes to which the backups are to be conducted as in the present invention.

Further, as described above, the claims of the present application additionally now recite that the performance of the volumes is monitored by use of a performance management table which includes for each volume entries regarding the RAID configuration constituting the volume, and the read and write performances of the volume and that a calculation of the restore performance is based on the RAID configuration constituting the volume, and the read and write performances of the volume. Such features are clearly not taught or suggested by Kitagawa.

In fact, in the Office Action the Examiner readily admits that:

“Kitagawa fails to teach a recovery object time and a performance management program”.

Although there are numerous other deficiencies of Kitagawa relative to the features of the present invention as recited in the claims, the Examiner alleges that Kitagawa is only deficient of the above described feature and that this deficiency is supplied by Shackelford. Applicants do not agree.

Shackelford simply teaches a computer program for automatically pairing target resources such as volumes or logical units to source resources containing data to be copied. Shackelford accomplishes such by determining the available target volumes for copying based upon metrics such as a recovery point or recovery time of the target volumes. Shackelford teaches that these user defined metrics could, for example, include performance statistics that may be used in place of or in addition to volume size as a characteristic for the matching/pairing of source and destination volumes.

The above described teaching of Shackelford is hardly related to the features of the present invention as recited in the claims where the performance of the volumes is monitored by use of a performance management table which includes for each volume entries regarding the RAID configuration constituting the volume, and the read and write performances of the volume and that a calculation of the restore performance is based on the information of the RAID configuration constituting the volume, and the read and write performances of the volume.

Thus, both Kitagawa and Shackelford suffer from various deficiencies relative to the features of the present invention as now more clearly recited in the claims. Particularly, both Kitagawa and Shackelford fail to teach or suggest the performance management program, the backup control program

and the performance management table including various entries such as that illustrated in Fig. 3 of the present application as in the present invention. At no point is there any teaching or suggestion in either Kitagawa or Shackelford that the performance management program maintains a performance management table which is used to manage disk and volume performance and that the information contained within the performance management table is used to calculate the restore performance as in the present invention. As described above, according to the present invention as recited in the claims and as illustrated in Fig. 3 the performance management table includes information indicating the read and write performances of the volume but also information regarding the RAID configuration which constitute the volume. As recited in the claims the performance management program calculates the restore performance based on at least the RAID configuration and the read and write performance of each volume. Such features are clearly not taught or suggested by either Kitagawa or Shackelford.

Thus, both Kitagawa and Shackelford fail to teach or suggest a performance management program which manages the performance of each volume of the disk device and a backup control program which issues an instruction to a differential management program, a pool management program and the performance management program for total backup control as recited in the claims.

Further, both Kitagawa and Shackelford fail to teach or suggest that the backup control program selects a backup method by which recovery within a user specified recovery object time is possible, according to a restore performance calculated by the performance management program and the

total size of changed blocks after backup acquisition is counted by the differential management program as recited in the claims.

Still further, both Kitagawa and Shackelford fail to teach or suggest that the performance management program maintains a performance management table which is used to manage disk and volume performance and calculate the restore performance as recited in the claims.

Still further yet, both Kitagawa and Shackelford fail to teach or suggest that the performance management table includes for each volume at least RAID configuration which constitute the volume, information indicating a read performance of the volume and information indicating a write performance of the volume wherein the restore performance is calculated based on at least the RAID configuration, read performance and write performance of each volume as recited in the claims.

Therefore, since both Kitagawa and Shackelford suffer from the same deficiencies relative to the features of the present invention as now more clearly recited in the claims, the combination of Kitagawa and Shackelford does not render obvious the features of the present invention as recited in the claims. Accordingly, reconsideration and withdrawal of the 35 USC §103(a) rejection of claims 1-6 and 9-22 as being unpatentable over Kitagawa in view of Shackelford is respectfully requested.

The remaining references of record have been studied. Applicants submit that they do not supply any of the deficiencies noted above with respect to the references utilized in the rejection of claims 1-6 and 9-22.

In view of the foregoing amendments and remarks, applicants submit that claims 1-22 are in condition for allowance. Accordingly, early allowance of claims 1-22 is respectfully requested.

To the extent necessary, the applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C., Deposit Account No. 50-1417 (TMI-5152).

Respectfully submitted,

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